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ON LABOUR MARKET THEORIES*

by

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ON LABOUR MARKET THEORIES

I - INTRODUCTION

The relation between the concept of the labour market and the Phillips curve has experienced some contradictory moments in the history of the theoretical debate on the determination of wages. The Phillips curve is one of the most popular examples in Economics of how an empirical finding, such as the negative correlation between inflation and unemployment, can rapidly gain a great success and be included in macroeconometric models without having a well developed theory to support it. As a result, in fact, this success offuscated the notion of the labour market and led to the standard practice in macroeconometric models of relegating the determination of wages to a wage-price block.

With the increasing instability of the empirical trade-off between inflation and unemployment [1], a decade after its "discovery" in the late 50's (Phillips 1958, Lipsey 1960), a substantial effort in the direction of the construction of its theoretical foundations was made. The coexistence of an accelerating rate of inflation and a non-decreasing rate of

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unemployment was becoming a lasting feature in the economic scene which stimulated the reformulation of the Phillips relation. The idea was to take into account the workers' concern about real wages by means of the introduction of inflationary expectations and explain why the Phillips curve could shift over time, thus determining an equilibrium rate of unemployment , the 'natural rate', which was consistent with an infinity of inflation rates.

The late 60's, therefore, marked a revival of interest in the labour market and the joint determination of employment and wages, in conjunction with the development of the microeconomic foundations of the Phillips curve (Phelps 1967,1970). In the '70s and 80's the literature on the microeconomic foundations of the Phillips curve reaffirmed, even more strongly, the labour market concept.

In very synthetic terms, two basic approaches can be identified in the recent literature of the labour market:

1) the competitive approach, which views the determination of wages as the outcome of the confrontation of the choices of firms and workers who act on an individual basis (in accordance with the concepts of the representative firm and worker);

2) the non-competitive approach, according to which the individual worker is assumed to stand in a weaker position and to be willing

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to form coalitions with the other workers before facing the firm (e.g. Trade Unions and Implicit Contract theories [2]).

The purpose of this paper is to analyze the differences and similarities in the initial assumptions and final predictions of the two approaches. In particular, I focus on trade unions' models, my aim being to show what are their implications about the characteristics of unemployment (voluntary or involuntary) and wages (flexible or rigid) they predict as compared to competitive models.

In section II, I discuss briefly Lucas' microfoundations of the Phillips curve as a representative example of competitive models that assume market clearing. I then give a brief account of "efficiency wage" models that, retaining the competition assumption, show why market clearing is not achieved. In section III I deal with the non-competitive approach to the labour market and then focus on trade unions models. I treat the two cases where the level of wages may be set either unilaterally by unions ('monopoly wage' models), or by means of a bargaining process over wages and employment between firms and unions (efficient bargaining models). Some concluding observations are given in section IV.

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II - COMPETITIVE MODELS OF THE LABOUR MARKET

II.I. Lucas microfoundations of the Phillips curve.

Lucas' justification for the Phillips curve is derived from the interconnection of the concepts of the worker's intertemporal substitution between leisure and consumption (Lucas and Rapping 1969) and misperception of aggregate shocks (Lucas 1973, 1975). In Lucas-Rapping model the following worker's labour supply function (in logs) is derived from utility maximization [3]:

$$L^s_t = a_o + a_1(w-p)_t - a_2(w^e_{t+1} - p_t - r_t) - a_3(p^e_{t+1} - p_t - r_t)$$

where w is the nominal wage, p is the price level, r the nominal interest rate and a_2, a_3 measure the intertemporal substitution effects between working more now (in the future) and consuming more in the future (now). This relation gives a 'micro' motivation for the Phillips curve: an unexpected increase in w_t and p_t, say, given r_t rises L^s_t (since w^e_{t+1} and p^e_{t+1} are given) by $a_2 + a_3 > 0$. Intuitively, this means that an unexpected increase in current inflation following an expansionary manoeuvre decreases unemployment under its "natural rate" because the worker supplies

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more labour. If this relation could be embedded in a general equilibrium model with imperfect information, we would have a theoretical confirmation of Friedman's message that the Phillips trade-off holds only after unanticipated aggregate shocks (which may be the result of economic policy decisions) because of temporary money illusion effects which prevent the workers from realizing that their real wage has actually changed.

Bull and Frydman (1983) have shown that this unification of intertemporal substitution and misperception in a general equilibrium model is indeed possible. They derive Lucas' Phillips curve by integrating this micro-model of labour supply in Lucas' "island parable" according to which the economic agents can observe the local conditions of production but can only predict the current values of aggregate variables. That means that the labour demand in each micro-market is known with certainty, since it depends on the observable product wage. The labour supply is instead subject to uncertainty because the workers base their labour supply decisions on the consumption wage, which is a random variable since it involves the prediction of the aggregate consumption price (the workers are assumed to consume also other goods which are not produced on their 'island').

Hence, integrating Lucas-Rapping model in Lucas' rational expectations-general equilibrium model with individuals'

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misperception of aggregate shock and market-clearing in both the labour and the product markets, Lucas' aggregate supply curve is obtained, whereby changes in output are a consequence of expectational errors following an unexpected shock in aggregate demand. The expectations-augmented Phillips relation is naturally derived inverting this supply function.

This approach is theoretically perfect in that it supplies complete microfoundations to the Phillips curve from the qualitative point of view. It suffers, however, from the heavy drawback that it is not confirmed by evidence. In other words, the concept of the worker who decides how much labour to supply today on the basis of his wage and price expectations for tomorrow and on the level of the rate of interest is not confirmed by the data (Altonji 1982, Ashenfelter and Card 1982, Andrews and Nickell 1982)[4].

This criticism goes pari passu with the observation that in this model, the labour demand is fixed and it is the labour supply which has the task of reequilibrating the labour market after an unexpected policy shock, because the introduction of uncertainty about the level of consumption wages makes it shift along the demand curve. This mechanism rules out the existence of involuntary unemployment which, instead, has always been one of

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the most challenging and real problems economic theory is confronted with.

II.II. Alternative theories of the competitive labour market: the "efficiency wage" hypothesis.

Since one of the main qualities of an economic theory is to fit the stylized facts, it seems quite extraordinary that a lot of energies have been devoted to convince the economic profession that unemployment is essentially voluntary, that is, market clearing always occurs. In fact, even if imperfect information is introduced in that framework, such as in Lucas' theory, it is hard to believe that a worker is involuntarily unemployed because if he "knew" more about the conditions of production he would not choose to remain idle.

There is a field of research, however, that retaining the competition assumption has made some progress towards the explanation of involuntary unemployment. These theories are founded on the "efficiency wage" hypothesis whereby wages are fixed unilaterally by firms.

The "efficiency wage" hypothesis is concerned with the explanation of why firms find it unprofitable to cut wages in the presence of involuntary unemployment [5]. The central hypothesis

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is that the single worker's productivity is closely related to the wage he earns in such a way that the firm may choose to retain a wage that is above the market clearing level, on the grounds that, by lowering it, it would reduce the average productivity of its workers and, by consequence, raise labour costs. Unemployment is involuntary because the unemployed worker keeps offering his labour, trying without any success to underbid his employed rivals. The equilibrium wage lies on the profit maximizing labour demand curve, but persistently above the labour supply.

Basically, we identify three groups of models:

1) the quitting models. Because quitting imposes costs on firms, employers have an incentive to discourage it by rising wages.[6]

2) The shirking model. It is based on the hypothesis of imperfect information about the workers' "on the job" behaviour:

> In the competitive paradigm, in which all workers receive the market wage and there is no unemployment, the worst that can happen to a worker who shirks on the job is that he is fired. Since he can immediately be rehired (because of full employment) he pays no penalty for this misbehaviour. With imperfect monitoring and full employment the worker will choose to shirk. To induce its workers not to shirk the firm attempts to pay more than the 'going wage'. Then if a worker is caught shirking he will pay a penalty. If it pays one firm to raise its wage, it will pay all firms to raise their wages. When they all raise their wages the incentive not to shirk again disappears. But as all firms raise their wages their demand for labour decreases and unemployment results. With unemployment, even if all firms pay the same wage a worker has an incentive not to shirk. For, if he is fired, he won't obtain immediately another job. The unemployment rate

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> must be sufficiently large that it pays workers to work rather than take the risk of being caught shirking." (Shapiro and Stiglitz,1984,p.433)

3) The adverse selection model. It is based on the assumption of imperfect information about the intrinsic productivity of each worker. If workers differ because of the degree of their ability they are likely to have different reservation wages. The firm, in order to screen itself from bad workers, will choose the policy of offering higher than average wages so as to attract more able job candidates (Weiss, 1980).

4) The gift exchange model. It is a sociologically oriented explanation of the occurrence of higher wages based on the concepts of loyalty of the firm towards the group of its most capable and faithful workers in the form of higher pay in exchange of higher quality of labour services (Akerlof,1982).

These models, therefore, are concerned with involuntary unemployment. Although no explicit macromodel exists, the explanation of the rise in unemployment in the 70's one can draw from them is that firms, given their concern for attracting good workers and for keeping their morale high, did not reduce real wages enough to cope with the increase in input prices and the productivity slowdown.

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This theory of wage determination is indeed suggestive and especially useful at a micro level. Its implications at a macro level might raise some doubts, given the recent exceptional increase in the unemployment rates occurred in many European countries at least. One of the major criticisms which is raised, in fact, is that in these countries it is seldom observed that firms set wages unilaterally, collective bargaining being the basic determinant of wages (7).

III - NON-COMPETITIVE MODELS OF THE LABOUR MARKET: THE BARGAINING THEORY OF THE LABOUR MARKET

The role of unions in the labour market is not a new topic in economic theory. The interest in this issue dates back at least to the mid '40s with the works of Dunlop (1944), Leontief (1946) and Ross (1948). In these studies unions start to be seen as entities with a well defined set of preferences, the real counterpart of firms. Since then, the subject has been more or less ignored until quite recently. With the increasing difficulty in explaining the economic performance of the Western countries, economists have realized that such important economic subjects as unions could no longer be ignored . In the late '70s and in the '80s, therefore, a consistent consolidation and refinement of the microeconomic

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theory of trade unions has taken place [8]. This theory turned out, last but not least, to serve as a new microfoundation for the Phillips curve. A lot of work, however, remains to be done on the empirical side. The econometric literature has just started to emerge and it seems that, until now, there has not been a lot of progress on this ground [9].

In its most general terms, the theory of trade union behaviour is concerned with the effects on wages and employment of bargaining between the firm and its unionized members. The firm is assumed to have a utility function over profits and the union over wages and employment [10]. Depending on the bargaining rule we can consider three cases:

1) the firm sets employment and the union sets the wage (monopoly union model);

2) the firm sets employment and then both the union and the firm bargain over the wage (the'right to manage'model);

3) the firm and the union bargain over both the wage and employment (the 'efficient bargaining'model).

The obvious theoretical tool for the analysis of the interplay between two parties is to be found in game theory. The most popular formal solution to a bargaining problem is Nash's. According to his result, the function to be maximized is the product of the parties gain over the non-bargaining outcome (see

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Appendix I). The Nash solution is the best suited to derive the equilibrium wage and employment of the three types of bargaining problems we have mentioned above.

We obtain the three models as special cases of a general specification of the Nash solution :

$$(1) \qquad \max \left[V\left(\pi(w,L)\right) - V(\bar{\pi})\right]^{b} \left[U(w,L) - \bar{U}\right]$$

where L is employment, w is the real wage, V and U are the utility functions of the firm and the union respectively; π are profits and $\bar{\pi}$ and $\bar{U}$ are the fall-back levels of profits and unions utility if no bargaining takes place; b is a parameter. The two differences represent the firm's and union's gain over the non-bargaining outcome.

The maximization of (1) with respect to L and w yields the efficient bargaining solution. Assuming L to be the labour demand function, that is L=L(w), the maximization of (1) with respect to w yields the 'right to manage'model. Assuming L=L(w), b=0 and maximizing (1) with respect to w we get the monopoly union outcome.

Let's discuss the three cases in detail.

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III.I. The efficient bargaining model.

In this model (McDonald and Solow, 1981) the firm and the union bargain over both the wage and the employment levels. The equilibrium value of employment L* and real wage w* are found making use of Nash's solution, that is solving the maximization problem (1).

For simplicity, let's assume that:

(2) $V(\pi) = \pi = R(L) - w L$

where R is the revenue function and $R'(L)>0$, $R''(L)<0$;if no bargaining takes place the firm does not employ any worker and has no revenue:

(3) $\pi = 0$, $V(0)=0$;

the workers are all identical and the union's utility is the same as the sum of their individual utilities:

(4) $U(w, L) = L\, u(w)$ and $\bar{U} = L\, \bar{u}$

where u is the worker's utility function; $\bar{u}$ is the worker's fall-back utility if he does not work for that firm and might be

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determined by employment benefits and/or by an alternative wage but, for the moment we write:

$$(5) \qquad \bar{u} = u (\bar{w})$$

where $\bar{w}$ represent any alternative wage.

Given these assumptions, the maximization problem (1) can be rewritten as:

$$(6) \qquad \max_{L,w} [R(L) - w L] [u(w) - u(\bar{w})] L$$

Maximizing with respect to L yields:

$$(7) \qquad R'(L) - 2 w L + R(L) = 0$$

so that the real wage is given by:

$$(8) \qquad w = (1/2)[R(L)/L + R'(L)]$$

Hence w is a decreasing function of L because of the form of the revenue function.

Maximizing (6) w. r. t. w yields:

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(9) $$L\,[\,u(w) - u(\bar{w})]/\,u'(w) = -R'(L)L + 2\,w\,L - w\,L$$

substituting $R(L) = -R'(L)L + 2wL$ from (7) in the r.h.s. of (9) we get:

(10) $$[u(w)-u(\bar{w})]/\,u'(w) = w - R'(L)$$

(10) yields the so called "contract curve" which is upward sloping in the L,w plane.

The intersection of (8) and (10) gives the Nash equilibrium solution L^* and w^*.

The economic intuition behind this analytical solution is as follows.

The firm is a profit maximizer and it is indifferent between the combination of employment and wages that leave its level of profits constant. That is:

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(11) $R(L) - wL = \bar{c}$

There are an infinite number of these isoprofit curves (see fig.1) and the lowest denotes the highest level of profits, since for any given L a lower w means higher profits. The firm's demand for labour curve is the locus of the maxima of the isoprofit curves [11]

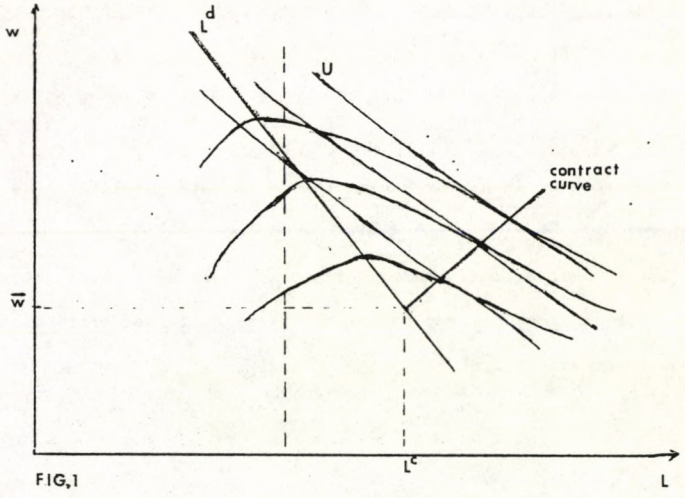

FIG.1

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The union has M identical members; L of them are employed by the firm. The expected utility of a union member is:

$$(12) \qquad e(u)=(L/M)\, u(w) + [\, (M - L)/M \,]\, u(\bar{w})$$

The union is indifferent between different combinations of w,L which leave the total gain in utility from employment constant, i.e.:

$$(13) \qquad L\, (\, u(w) - u(\bar{w})\,) = \bar{g}$$

Graphically, the equilibrium values L* and w* are given by the tangency points of the firm's isoprofit curves and the union's indifference curves. Their locus defines the "contract curve".

Finding the slopes of (11) and (13) in the L,w plane and equating them we get:

$$(14) \qquad \frac{u(w) - u(\bar{w})}{u'(w)\, L} = \frac{w - R'(L)}{L}$$

equal to (10) which we derived using the Nash bargaining function.

Another interesting iterpretation of this result is that the worker, whose expected utility is:

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(15) $$p\,u(w) + (1-p)\,u(\bar{w})$$

where p=L/M is the probability of being employed by the firm, equates at equilibrium, the marginal utility of one unit more of income multiplied by the probability of being employed with the marginal loss derived from the increased probability of not finding a job given his new request.

In formulae this is:

(16) $$\frac{d(1-p)}{dw}\,(\,u(w) - u(\bar{w})\,) = p\,\frac{du(w)}{dw}$$

and:

(17) $$\frac{d(1-p)}{dw} = -\frac{dp}{dw}$$

(16) implies again the Nash solution since substituting p=L/M in it we get:

(18) $$-\frac{u(w) - u(\bar{w})}{u'(w)}\,\frac{1}{L} = \frac{dw}{dL}$$

where dw/dL is the slope of the isoprofit curve which then yields the contract curve [12].

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If such contracts are enforced in the labour market, the employer will, in all probability, be off his labour demand curve. In fact, the contract curve coincides with the labour demand curve at w only, which can be interpreted as the competitive level of the real wage. Otherwise, at any other equilibrium point, the wage is higher than the marginal productivity of labour. The efficiency of the contract lies in the fact that both the firm and the union are better off if they choose an agreement on the contract curve than in any other region of the L,w plane (Pareto optimality is achieved) [13]. Here, as in many models that attempt to explain wage rigidity and involuntary unemployment, it is assumed that a perfect insurance market does not exist. If it existed, workers could go and insure themselves against the fluctuations in their income. Here, instead, workers look for an indirect way to overcome this market imperfection. From this observation Oswald (1985) draws the intuition as to why a Pareto-optimal wage bargain is likely to increase employment rather than reduce it:

> "In an ideal world each union member would like to purchase full insurance - that is , insurance which equates his or her marginal utility of income across all states of nature - against the risk of unemployment. That possibility is assumed away here: an unemployed person receives only government benefit, b. There is a way to achieve insurance indirectly, however, because the union can reduce the risk of any individual being laid off. Hence it sets employment above the level which it would desire if insurance markets were perfect (that is also the competitive level).

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> Overemployment is rational; it is the optimal way to reduce risk at the expense of technical efficiency."

The question concerning which point on the contract curve will be chosen is merely a matter of power: higher levels of wages and employment will be the signal of a more powerful union, whereas a more profitable firm is behind lower levels of both these variables. To derive a unique solution we therefore need a rule determining the distribution of revenue between the employer and the workers. In our Nash solution this sort of "equity locus", as McDonald and Solow (1981) call it, is given by (8), which states that the real wage is equal to the mean of the average and marginal revenue product of labour.

Once the formal structure of the efficient bargaining model is set up, it is possible to see how the equity locus and the contract curve shift with aggregate demand changes. If these changes cause the two loci to shift in an offsetting fashion it is possible to explain the stylized fact of wage rigidity and employment fluctuations over the business cycle.

Let's now turn to the two other bargaining models.

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III.II The right to manage model and the monopoly union model.

We consider now the case of the firm setting employment according to the profit maximizing rule:

(18) $\max_{L} \quad (w,L)$

which yields:

(20) $L^* = L^*(w)$

In the right to manage model the firm sets employment and bargains over wages with the union (Nickell and Andrews, 1983). Although this model has the appealing property of being more realistic than the other two, it yields the same predictions of the monopoly model: the explanatory variables of the wage level and their predicted sign are identical. On this issue there are some problems which have not been settled yet.

For simplicity, we shall concentrate on the monopoly model which will be the basis of our empirical specification.

Using the same simplifications of section 4.4.1, the equilibrium combination of wages and employment is given by the tangency point of the labour demand curve with the union's indifference curve (see fig.2).

The labour demand curve is given by:

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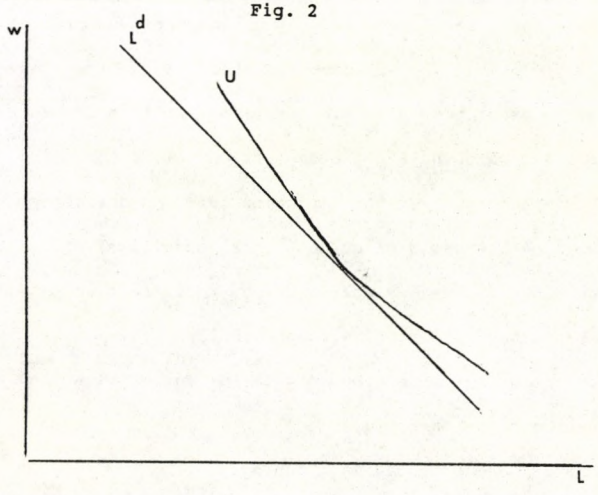
(21) $$R'(L) - w = 0$$

The solution is therefore:

(22) $$\frac{u(w) - u(\bar{w})}{u'(w)\, w} = \frac{L\, R''(L)}{w}$$

(22) says that the reciprocal of the elasticity of the gain on employment with respect to wages is equal to the wage elasticity of demand for labour taken positively.

Fig. 2



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IV - CONCLUDING OBSERVATIONS.

It is now time to ask if the above trade unions models supply a valid alternative to competitive models for the explanation of the existence of involuntary unemployment and wage rigidity.

The models where the firm sets employment say that the equilibrium wage is on the labour demand curve, but above the competitive level, because of the action of the union which exerts some of its monopoly power. Wage rigidity with respect to demand changes arises only if specific assumptions on the structural form of the labour demand function are made, such that the wage elasticity of demand in (22) is constant.

The efficient bargaining model , as we have seen, predicts overemployment, thus failing to give an answer to one of the two crucial issues. Wage rigidity, as in the monopoly union models, arises only if specific parameters are chosen such that the contract curve and the equity locus shift in an offsetting way after demand shocks.

As far as the bargaining set up of the efficient bargaining model is concerned, the criticism that is usually raised about this model is that it is not clear if, in reality, unions bargain about the level of employment. There are some papers based on

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survey data which yield contradictory results for Britain [14]. Andrews and Nickell (1983, p.509) say on this point:

> Since the previous model [the monopoly model] does not have this rather appealing property [Pareto efficiency], it is worth considering why firms might wish to impose the negotiating rule that they will only talk about wages when the outcome is such that futher discussion about employment could yield higher profits without impairing the union's welfare. One powerful argument is that, as we have already noted, firms find it desirable to make continuous adjustment to their total level of employment. They would presumably find the idea of continual negotiation on this issue, with possible discussion on wages thrown in, as simply too costly an interference with their managerial function."

And also (p. 510):

> This model has the strong implication that a rise in union power will raise employment. Since we know of no evidence either in our results or elsewhere, to support this contention, this is an additional reason for not pursuing this particular model any further."

The monopoly union model, on the other hand, has the unrealistic feature that unions set the wage without having to negotiate with firms.

It must be added that there are some special cases in which efficient bargains and monopoly equilibria are identical, that is they lie on the labour demand curve. These special cases arise if

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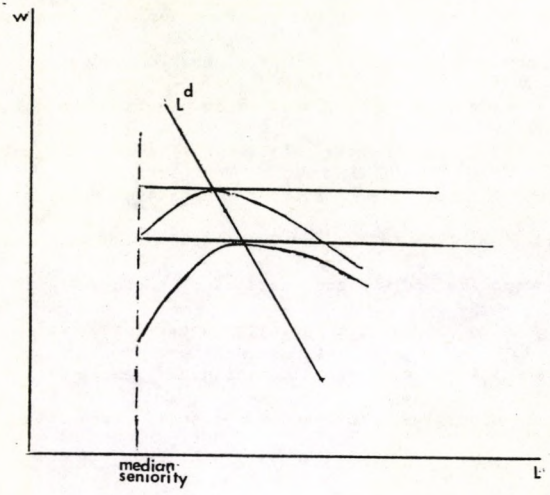
the union's indifference curve has some flat segments and it touches the firm's isoprofit curve there. In this case the contract curve and the labour demand curve coincide (fig.3)

Fig. 3



When is the union's indifference curve flat?

One possible explanation might be given using the "seniority " model (Grossmann 1983). This model is based on the assumption that lay-offs follow a "last in first out" rule and that the union takes its decisions according to a majority rule. Hence, if the majority of its members are senior workers in the firm and they are mostly concerned with wage increases, the indifference curve

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of the union will be flat starting from the median seniority voter.

Once account is taken of the institutional setting of the specific sector or industry under study, the last word about the superiority of one model over the other is left to econometric testing. Some econometric studies about specific industries or sectors are already available [15]. What seems to be quite a difficult task, is to construct a statistical test that would allow to reject either the efficient bargaining model or the monopoly union model. Ashenfelter and Brown (1985) and Card (1985) use the following method. Since wage and employment in the efficient bargaining model are jointly determined, all the variables determining wages should influence employment and viceversa. In the monopoly union model, instead, the wage is chosen given the level of employment. If empirically, it turns out that employment is not affected by the variables determining wages, then one might not reject the hypothesis of a monopoly union framework. These are only preliminary results, however, and a lot of work is required before we can confidently rely on them.

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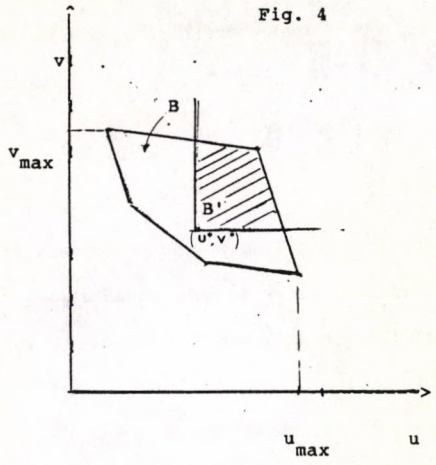
APPENDIX I

Let's assume that the bargaining set B, that is the set of pairs of firm's and union's utilities (v and u respectively), is closed, bounded and convex.

Let's represent it in the v,u plane [26].

Fig. 4



Suppose that the point $(u^*,v^*) \in B$ is the payoff of the union and firm when no bargaining takes place. Of course, the firm would rather obtain v_{max} and the union u_{max}, but these two wishes are

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incompatible. Any bargaining point in the shaded area, however, would be preferred by both to the point (u^*,v^*) and considered a fair outcome.

Nash shows that if we displace the origins of the axis so that $(u^*,v^*) \in B=(0,0) \in B'$ and chose (u'_o,v'_o) in such a way that:

a) $(u'_o, v'_o) \in B'$ and $u'_o, v'_o > 0$;

b) $u'_o v'_o \geq uv$ for all $(u,v) \in B'$,

then the point (u'_o, v'_o) is the solution to the bargaining game in B'.

Since $u'_o = u_o - u^*$, and $v'_o = v_o - v^*$ where $(v_o, u_o) \in B$ we get that:

$$(A1) \qquad (u_o - u^*)(v_o - v^*) \geq (u - u^*)(v - v^*)$$

for all $u,v \in B$ and such that $u \geq u^*$, $v \geq v^*$.

This functional form is the only one which satisfies the following four axioms required for a bargaining solution:

1) invariance w.r.t. utility transformations;

2) Pareto optimality;

3) independence of irrelevant alternatives;

4) symmetry [27].

There are many objections to the axioms that underly the Nash solution but, as far as we know, solutions based on more satisfactory axioms have led to complicated arithmetic solutions and messy comparative static results (Kalai and Smorodinsky,1975).

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Footnotes

1 This fact has been well documented for the U.S. by R. J. Gordon (1970,1971,1977).

2 The theory of implicit contracts must be included among the present most popular theories of the labour market. See the seminal papers by Azariadis (1975) and Hart (1983).

3 This result is obtained from the maximization of an individual's two-period utility function of consumption and leisure subject to his two-period budget constraint.

4 Until recently, econometricians have not paid much attention to the intertemporal substitution hypothesis despite its theoretical importance. Solow (1980, p.7) literally attacks its believers:

> "It is astonishing that believers have made substantially no effort to verify this central hypothesis. I know of no convincing evidence in its favour, and I am not sure why it has any claim to be taken seriously."

Altonji (1982) provides a careful investigation of whether the intertemporal substitution model can explain the annual time series data for the U.S. His results, and much other evidence he cites, raise serious doubts about the empirical viability of the intertemporal substitution-market equilibrium view of the labour market. Ashenfelter and Card(1982) estimate a simplified model with intertemporal substitution but their results as well confirm the incapability of this assumption to explain the U.S. labour market in the years 1956:1-1980:1. Andrews and Nickell (1982) estimate a competitive model for the U.K.(1948-1979) and contrast its results with those of a non-competitive one. They draw the conclusion that the competitive model does not fit the facts.

5 For an excellent survey of this literature see Yellen (1984).

6 See e.g. Calvo(1979), Salop (1979), Stiglitz (1974).

7 The efficiency wage hypothesis, anyway, might prove to be useful for explaining other important components of the determination of wages such as, for example, the wage drift.

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8 See the majority of Oswald's papers, and in particular Oswsld 1979, 1982, 1985).

9 See the survey papers by Farber (1985) and Pencavel (1985).

10 There is a vast literature concerning the choice of the union's utility function. In recent contributions to this issue two main streams may be identified :
1) studies that make use of an expected utility or utilitarian function (e.g. McDonald and Solow, 1981);
2) studies which assume a specific structural form to replace the general quasi-concave utility function (e.g. Pencavel, 1984a,b who chooses a Stone-Geary utility function).
See on this point Oswald (1985).

11 The isoprofit curves are given by the implicit derivation of (11):

(11a) $dw/dL = [R'(L) - w]/L$

Their maxima are given equating (11a) to zero so that:

(11b) $R'(L) = w$

which is the labour demand equation.

12 Sutton (1985) shows how any Nash equilibrium of a wide range of non-cooperative games will, in the limit, coincide with the Nash bargaining solution.

13 The idea that the union and the firm are better off above and to the right of the labour demand curve is originally due to Leontief (1946)

14 See for the British economy e.g. Oswald and Turnbull (1985) for evidence against this hypothesis, and Daniel and Millward (1983) for evidence in favour.

15 See e.g. Carruth and Oswald (1985), who focus on the British post war coal sector and the role of the National Union of Mine workers; MaCurdy and Pencavel (1985) focus on data on U.S. typographical unions.

16 This short exposition of Nash's solution follows Luce and Raiffa (1957), pp.124-28.

17 See assumptions on p.126-7 and proof of unicity p. 128 by Luce and Raiffa (1957).

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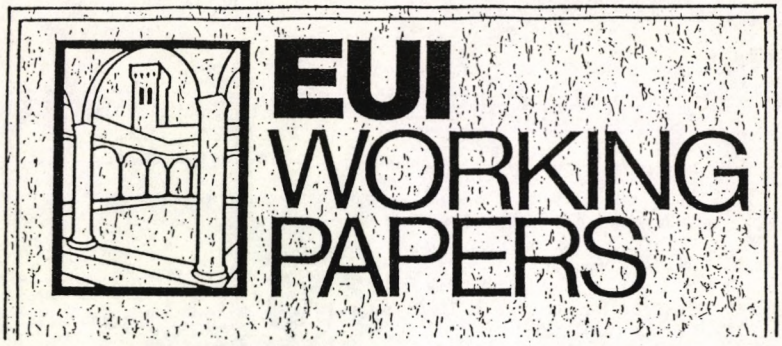

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